MHCC | **MARYLAND HEALTH CARE COMMISSION**

Health Information Technology

An Assessment of Maryland Hospitals

August 2010

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About the Survey

The Maryland Health Care Commission (MHCC) developed the *Hospital Health Information Technology Survey* (survey) to assess the adoption and extent of utilization of health information technology (health IT) among the acute care hospitals in Maryland. The MHCC developed the survey with the assistance of the hospital Chief Information Officers (CIOs).[1] This is the second year of the survey. The MHCC worked with CIOs to enhance the survey using their feedback from the prior year. Hospitals use the survey results to compare their overall health IT adoption with other Maryland hospitals and to identify areas where they could improve health IT adoption relative to other hospitals in the state. The survey is designed to enable a comparison of health IT adoption in Maryland with national activity.[2,3,4] The ability to evaluate the state's progress to national activity provides valuable insight as to how well Maryland compares with the nation in health IT adoption.

Report Limitations

The purpose of this report is to inform stakeholders on hospital implementation and planning activities related to health IT in Maryland. The information presented in this report is based upon a self-assessment performed by the hospitals. The MHCC worked closely with CIOs to structure the questions in such a way as to limit interpretation differences among the responders. Findings from the survey are reported in aggregate and are not audited. Next year, the MHCC plans to include information in the report specific to individual hospitals. Last year, three hospitals that are part of a health system combined their responses to the survey with their corporate hospital. This year these hospitals reported separately, and some adjustments were made in the way the data was reported from the prior year to allow for a comparison with current year data.

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[1] See the *Acknowledgements* section at the end of this report (pgs. 20-21) for a listing of the CIOs.
[2] In collaboration with the American Hospital Association (AHA), the Robert Wood Johnson Foundation (RWJF) published a national report on hospital health IT adoption for 2009. The RWJF survey was included in the AHA's annual hospital survey and provides a comparable assessment to the report published by the AHA in 2007, which was used by the MHCC for the 2008 survey analysis.
[3] Robert Wood Johnson Foundation, *Health Information Technology in the United States: On the Cusp of Change*, 2009. Available at: http://www.rwjf.org/files/research/hitfullreport.pdf.
[4] American Hospital Association, *Continued Progress: Hospital Use of Information Technology*, 2007. Available at: http://www.aha.org/aha/content/2007/pdf/070227-continuedprogress.pdf.

Hospital Health IT Adoption

Maryland hospitals have an overall health information technology (health IT) adoption rate of approximately 57 percent. The Maryland Health Care Commission (MHCC) developed the *Hospital Health Information Technology Survey* (survey) as a tool to assess the level of health IT adoption among the state's 47 acute care hospitals. The survey focuses on health IT that has a direct impact on patient care and has the potential to improve the quality, safety, and efficiency of health care. The areas of health IT included in the survey are computerized provider order entry (CPOE), electronic health records (EHRs), electronic medication administration records (eMARs), barcode medication administration (BCMA), infection surveillance software (ISS), electronic prescribing (e-prescribing), and electronic data exchange with community providers. Findings are presented by aggregate, hospital size, geographic location, and hospital affiliation.[5]

Hospitals that use health IT are better able to monitor data. This can help them identify factors contributing to poor patient outcomes and implement quality improvement initiatives to address the issues identified.[6,7] This year, Maryland hospitals achieved adoption levels of more than 25 percent in all seven health IT categories, while exceeding 50 percent adoption in four categories, and 75 percent in two other categories. In comparison to the prior year, eMAR and BCMA each experienced an increase of roughly 28 percent. While e-prescribing adoption trails the other categories, approximately 19 percent of hospitals adopted this technology in 2009. Roughly 4 percent of hospitals adopted EHRs this year, and the same increase was also reported for data sharing. CPOE had about a 13 percent increase in adoption and ISS experienced around a 2 percent decrease. The slight decrease is likely attributed to responder interpretation of the survey question.

Comparison of 2008 and 2009 Health IT Adoption *(n=47)*			
Health IT Functions	**Number of Hospitals**		**Variance**
	2008[8]	*2009*	*Gain/(Loss)*
Computerized Physician Order Entry	26	32	6
Electronic Health Record	36	38	2
Electronic Medication Administration Record	24	37	13
Barcode Medication Administration	14	27	13
Infection Surveillance Software	21	20	(1)
Electronic Prescribing	4	13	9
Electronic Data Exchange	19	21	2

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[5] See *Hospital Characteristics* in Appendix C.

[6] Curaspan Health Group, *Curaspan Customers Cut Preventable Readmission Rates and Save Almost $180 Million in One Year*, March 24, 2010. Available at: http://www.prnewswire.com/news-releases/curaspan-customers-cut-preventable-readmission-rates-and-save-almost-180-million-in-one-year-89011942.html.

[7] American Hospital Association, *Patient Satisfaction Higher at Most Wired Hospitals*, July 15, 2008. Available at: http://www.aha.org/aha/press-release/2008/080715-pr-mostwired.html.

[8] Three hospitals that are part of local health systems combined their responses to the 2008 survey and given their identifiable characteristics (i.e., size, geographic location, etc.) were aligned, the findings were based on feedback from 44 hospitals. Data was recast for comparison purposes for this report.

Computerized Physician Order Entry

CPOE[9] helps to mitigate the risks associated with the manual order entry process and improve efficiencies by enabling providers to enter patient care orders directly into the computer system.[10] Nationally, CPOE adoption is around 32 percent with approximately 20 percent of hospitals that have fully implemented CPOE in all primary care units (PCUs)[11] and roughly 12 percent that have implemented CPOE in at least one PCU. Around 25 percent are assessing or implementing and roughly 42 percent do not have plans to adopt this technology.[12,13] In Maryland, CPOE adoption is approximately 68 percent with roughly 32 percent that have fully implemented this technology in all PCUs, which is around a 4 percent decrease from last year, and about 36 percent that have implemented CPOE in at least one PCU, which is an increase of approximately 17 percent from the prior year. Overall, the number of hospitals that reported they are in planning decreased by about 13 percent from the prior year, as these hospitals have moved forward with implementing health IT. This year, approximately 23 percent report that they intend to either assess or implement, and less than 9 percent are undecided about adopting CPOE.

CPOE Implementation (n=47)					
2008			**2009**		
Fully	Partially		Fully	Partially	
17	9		15	17	
Planning					
Assessing	Implementing	Undecided	Assessing	Implementing	Undecided
9	10	2	3	8	4

Clinical Decision Support

Clinical decision support (CDS)[14] is system intelligence that can be integrated with CPOE to produce prompts for standards of care (SOC) guidelines and medications alerts when orders are being entered into the system by the prescribing provider.[15] CDS adoption is reported nationally at around 34 percent for SOCs and about 61 percent for medication alerts.[16] Approximately 42 percent of hospitals nationally do not have plans to adopt SOC CDS technology and roughly 22 percent are undecided about adopting

CDS Integration (n=47)			
2008		**2009**	
Medication CDS	Diagnosis/SOC CDS	Medication CDS	Diagnosis/SOC CDS
17	10	28	19

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[9] CPOE enables providers to enter orders directly into the information system [see *Survey Glossary* in Appendix B].
[10] The Leapfrog Group, *Computerized Physician Order Entry: Fact Sheet*, April 9, 2008. Available at: http://www.leapfroggroup.org/media/file/Leapfrog-Computer_Physician_Order_Entry_Fact_Sheet.pdf.
[11] [11] PCUs are the hospital departments that provide direct patient care [see *Survey Glossary* in Appendix B].
[12] Ibid.
[13] The RWJF report segregated medication and laboratory data. Laboratory data presented the highest adoption rates; as such, this category was selected to represent the national data for CPOE.
[14] CDS is a computer application to assist in clinical decisions by providing evidence-based knowledge in the context of patient-specific data [see *Survey Glossary* in Appendix B].
[15] Agency for Healthcare Research and Quality, *Making Health Care Safer: A Critical Analysis of Patient Safety Practices*, July, 20, 2001. Available at: http://www.ahrq.gov/clinic/ptsafety/pdf/ptsafety.pdf.
[16] The RWJF report assessed CDS categories individually. Clinical Reminders and Drug Allergy Alerts had the highest adoption rates among their respective sections and were the categories used to represent the national data.

technology for drug alerts.[17] Statewide, around 60 percent of hospitals report having CDS for medication prescribing, which is an increase of around 23 percent from the prior year. Roughly 40 percent of hospitals report that their CPOE technology has CDS capabilities for diagnosis, SOCs, and chronic conditions, which is an increase of about 19 percent from last year. While CDS is not a standard feature of CPOE systems, the findings indicate that Maryland hospitals are investing in technology to enhance decision making during the patient care order entry process.

Electronic Health Records

EHRs[18] have the capability to improve the quality, safety, and efficiency of health care by furnishing health information in a consolidated record to the health care provider at the time care is rendered.[19] Nationally, EHR adoption is roughly 57 percent with around 36 percent being fully implemented in all PCUs and about 21 percent deployed in at least one PCU. Approximately 18 percent plan to adopt and around 24 percent report having no immediate plans to implement this technology.[20] In Maryland, EHR adoption was approximately 81 percent. Around 55 percent of hospitals report having fully implemented EHRs in all PCUs and roughly 26 percent have partially implemented EHRs. This is a slight increase of about 2 percent from the prior year for each category. Regarding planning, approximately 11 percent of hospitals are planning to assess or implement this technology, while less than 9 percent remain undecided.

EHR Implementation (n=47)					
2008			**2009**		
Fully		Partially	Fully		Partially
25		11	26		12
Planning					
Assessing	Implementing	Undecided	Assessing	Implementing	Undecided
5	1	5	3	2	4

Electronic Medication Administration Records

eMARs[21] provide hospital staff with an accurate record of the medications ordered and a clear record of any changes ordered to the patient's medications.[22] Nationally, around 62 percent of hospitals have adopted eMAR technology with about 45 percent fully implemented in all PCUs and roughly 17 percent implemented in at least one PCU. Approximately 18 percent are planning to adopt this technology and about 20 percent are undecided.[23] Hospitals in Maryland report eMAR adoption at around 79 percent, which is an increase of about 28 percent for this reporting period. Roughly 32 percent have fully implemented eMARs in all of their PCUs, which is around an 11 percent increase from last year, and about 47 percent have implemented eMARs in at least one PCU, which is an increase of around 17

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[17] The RWJF report assessed CDS functions as clinical (guidelines and reminders) and drug (allergy, drug interaction, lab interaction, and dosing support). The highest percent was used from the respective category to present the national adoption rate and the lowest rate used when presenting those that do not have plans to adopt the technology.

[18] An EHR is a longitudinal collection of electronic health information that serves as a legal medical record [see *Survey Glossary* in Appendix B].

[19] G.D. Schiff and D.W. Bates, *Can Electronic Clinical Documentation Help Prevent Diagnostic Errors?*, The New England Journal of Medicine, March 24, 2010. Available at: http://healthcarereform.nejm.org/?p=3217&query=home.

[20] Ibid.

[21] An eMAR is an electronic record of medications administered to a patient during their hospital stay [see *Survey Glossary* in Appendix B].

[22] Health Care Systems, *e-Mar Benefits*, 2010. Available at: http://www.hcsinc.net/HCS-e-Mar/emar-benefits.html.

[23] Ibid.

percent from the prior year. This increase is consistent with the percent of hospitals that were planning to implement eMAR technology last year. Around 15 percent of hospitals plan to assess or implement and the number of hospitals undecided about adopting eMARs increased by roughly 2 percent this year.

eMAR Implementation (n=47)					
2008			2009		
Fully		Partially	Fully		Partially
10		14	15		22
Planning					
Assessing	Implementing	Undecided	Assessing	Implementing	Undecided
6	15	2	5	2	3

Barcode Medication Administration

BCMA[24] decreases medication errors by establishing a medication process that validates that the right patient is receiving the right medication in the right dose via the right route at the right time, right at the point when the medication is administered.[25,26,27] Nationally, BCMA adoption is approximately 41 percent.[28,29] Statewide, BCMA adoption was reported at roughly 57 percent with approximately 13 percent of hospitals reported having implemented BCMA in all PCUs; this is an increase of around 11 percent from the prior year. Around 45 percent of hospitals implemented BCMA in at least one PCU, which is an increase of around 17 percent. About 17 percent that are uncertain about adopting BCMA and roughly 26 percent that intend to assess or implement this technology.

BCMA Implementation (n=47)					
2008			2009		
Fully		Partially	Fully		Partially
1		13	6		21
Planning					
Assessing	Implementing	Undecided	Assessing	Implementing	Undecided
4	20	9	6	6	8

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[24] BCMA is technology that uses an infrared scan of the barcodes on the patient's bracelet and medication package at the bedside [see *Survey Glossary* in Appendix B].
[25] D.W. Cescon and E. Etchells, *Barcoded Medication Administration: A Last Line of Defense*, The Journal of the American Medical Association, 299(18), May 14, 2008. Available at: http://jama.ama-assn.org/cgi/content/extract/299/18/2200.
[26] Medsphere, OpenVista Bar Code Medication Administration, 2010. Available at: http://www.medsphere.com/solutions/openvista-for-the-clinic/bar-code-medication-administration.
[27] B. Monegain (ed.), *Bar-coding with eMAR Tech Shown to Boost Safety*, Healthcare IT News, May 6, 2010. Available at: http://www.healthcareitnews.com/news/bar-coding-emar-tech-shown-boost-safety.
[28] Ibid.
[29] The RWJF report presented the BCMA data divided into four quartiles according to the Disproportionate Share Hospital (DSH) Index. The lowest (4th) quartile data had the highest adoption rate and was the rate used to present the national data.
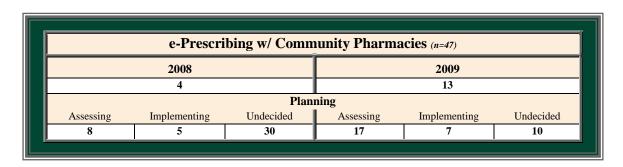
Infection Surveillance Software

ISS[30] allows hospitals to automate infection monitoring and evaluate trends. This technology increases efficiency, reduces amount of resources necessary in a manual process, decreases the length of time to identify the issue and respond, improves patient outcomes, and increases financial reimbursement.[31,32] Nationally, roughly 82 percent have adopted ISS and about 8 percent are undecided.[33] Statewide, ISS adoption was reported at around 43 percent during this reporting period. Though in paper form, most hospitals have monitored the rate of infectious disease for a number of years. Roughly 28 percent of hospitals plan to assess or implement ISS while approximately 30 percent are undecided about adopting this technology, which is an increase of about 9 percent from last year. The increase in the number of hospitals that are undecided about adopting suggests that hospitals have not concluded on the appropriate timing to implement the technology.

ISS Implementation (n=47)					
2008			2009		
21			20		
Planning					
Assessing	Implementing	Undecided	Assessing	Implementing	Undecided
7	9	10	11	2	14

Electronic Prescribing

e-Prescribing[34] enables providers to send prescriptions electronically to a pharmacy. This process improves the safety of the current paper prescription process by transmitting a legible prescription in an electronic format directly to the pharmacy.[35] e-Prescribing allows providers to determine if the medication is on the patients insurance formulary and helps to facilitate the prescription process so that the prescription is ready when the patient arrives at the pharmacy.[36] Nationally, approximately 18 percent

e-Prescribing w/ Community Pharmacies (n=47)					
2008			2009		
4			13		
Planning					
Assessing	Implementing	Undecided	Assessing	Implementing	Undecided
8	5	30	17	7	10

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[30] ISS is technology that electronically tracks the rates of infection outbreaks [see *Survey Glossary* in Appendix B].

[31] C. Orlovsky, *Infection-Catchers: New Technology Combats HAIs, Tracks Potential Outbreaks*, NurseZone. Available at: http://www.nursezone.com/Nursing-News-Events/devices-and-technology/Infection-Catchers-New-Technology-Combats-HAIs-Tracks-Potential-Outbreaks_32350.aspx.

[32] B. Menegain (ed.), *Infection Control Software Market Poised Rapid Growth*, Healthcare IT News, June 23, 2009. Available at: http://www.healthcareitnews.com/news/infection-control-software-market-poised-rapid-growth.

[33] Hospitals and Health Networks, *Infection Surveillance: A Better Way to Beat Bugs*, January 2009. Available at: http://www.hhnmag.com/hhnmag_app/jsp/articledisplay.jsp?dcrpath=HHNMAG/Article/data/01JAN2009/0901HHN_FEA_Technology_SB1&domain=HHNMAG

[34] e-Prescribing is the electronic transmission of a prescription to a community pharmacy [see *Survey Glossary* in Appendix B].

[35] Centers for Medicare & Medicaid Services, *E-Prescribing: Overview*. Available at: http://www.cms.gov/ePrescribing/.

[36] J. Henry, *E-Prescribing: Improve Profits, Increase Productivity, and Deliver Better Patient Care*, Vision Care Venture, December 2009. Available at: http://www.first-insight.com/EPrescribing-ImproveProfits-IncreaseProductivityDec09.pdf.

of prescriptions were sent electronically.[37] Statewide, approximately 28 percent of hospitals e-prescribe discharge medications to community pharmacies. The percent that plan to assess or implement nearly doubled during this reporting period to around 51 percent and about 21 percent are undecided, which is a decrease of about 43 percent from the prior year.

Electronic Data Sharing with Providers

The ability to share health information electronically with community providers improves care coordination by delivering information to the provider when it matters most – at the point of care. When providers have the information to make informed medical decisions, patient outcomes are improved.[38,39] Nationally, approximately 72 percent of hospitals are electronically exchanging some patient information with other providers.[40,41] During this reporting period, about 45 percent of Maryland hospitals report exchanging some patient information electronically with providers in their service area, which is an increase of roughly 4 percent. The percent of hospitals that are assessing or implementing increased by approximately 21 percent, while the percent that are undecided decreased by about 26 percent.

Data Sharing w/ Community Providers (n=47)					
2008			2009		
19			21		
Planning					
Assessing	Implementing	Undecided	Assessing	Implementing	Undecided
6	3	19	17	2	7

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[37] Surescripts, *Advancing Healthcare in America: 2009 National Progress Report on E-Prescribing, Plus What's Ahead in 2010 and Beyond*, 2009/2010. Available at: http://www.surescripts.com/downloads/NPR/national-progress-report.pdf.
[38] Brooklyn Health Information Exchange. Available at: http://www.bhix.org/.
[39] Agency for Healthcare Research and Quality, *Evolution of State Health Information Exchange: A Study of Vision, Strategy, and Progress*, January 2006. Available at:
http://www.avalerehealth.net/research/docs/State_based_Health_Information_Exchange_Final_Report.pdf.
[40] Ibid.
[41] The RWJF report divided data sharing into four quartiles according to the DSH Index. The 3rd quartile had the highest adoption rate and was the rate used to present the national data.

Hospital Size

Large hospitals are more likely to adopt health IT than smaller hospitals, in part, because of the financial resources available to larger organizations.[42] Maryland hospitals' health IT adoption was assessed by size, which was based on the number of licensed beds. Hospitals with more than 500 beds are categorized as academic hospitals, 250 to 500 beds are considered large, 100 to 249 are medium-sized, and less than 100 beds are characterized as small hospitals.[43,44] Variation from year to year in the number of hospitals in a couple of sections is attributed to changes in the number of licensed beds. Statewide, academic hospitals have the highest health IT adoption rate at roughly 71 percent. Medium size hospitals statewide have the next highest health IT adoption rate at approximately 61 percent, which exceeds large hospitals by around 1 percent and small hospitals by roughly 23 percent. Medium hospitals in Maryland are keeping pace with large hospitals, which in contrast to national findings that medium and small hospitals are less likely to adopt health IT.[45]

As reported last year, all academic hospitals have implemented EHRs. Approximately 90 percent of medium size hospitals report having adopted EHRs, which exceeds large hospitals by approximately 9 percent and small hospitals by roughly 40 percent. CPOE has already been adopted by all academic hospitals while about 81 percent of large hospitals report adoption of this function, which is roughly 14 percent more than medium size hospitals and about 43 percent over small hospitals. Approximately 50 percent of the academic hospitals report that they have the capability to e-prescribe. Small hospitals report e-prescribing adoption at about 38 percent and medium size hospitals at around 33 percent, which exceed the adoption rates of e-prescribing by large hospitals by roughly 20 percent. Large hospitals lead in the exchange of electronic health information with community providers at around a 56 percent adoption rate. This exceeds academic hospitals by roughly 6 percent, small hospitals by about 18 percent, and medium size hospitals by around the same percent.

Academic

Academic hospitals account for approximately 4 percent of all hospitals in Maryland. These hospitals have fully adopted CPOE, EHRs, eMARs, and ISS. Academic hospitals have yet to adopt BCMA technology and all of these hospitals plan to either assess or implement this technology. Roughly 50 percent have adopted e-prescribing and the same amount is electronically exchanging data with community providers. Around 50 percent plan to implement e-prescribing and the same percent plan to assess data sharing capabilities.

Health IT Function	Number of Hospitals *(n=2)*		Variance
	2008	*2009*	*Gain/(Loss)*
Computerized Provider Order Entry	2	2	-
Assessing	-	-	-
Implementing	-	-	-
Undecided	-	-	-
Electronic Health Record	2	2	-
Assessing	-	-	-
Implementing	-	-	-
Undecided	-	-	-

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[42] Ibid.

[43] Maryland Health Care Commission, *Update Licensed Acute Care Hospital Beds: Maryland Acute Care General Hospitals*, 2011. Available at: http://mhcc.maryland.gov/hospital_services/acute/acutecarehospital/annrptlicbedsfy11_20100714.pdf.

[44] See *Hospital Characteristics* in Appendix C

[45] Ibid.

Health IT Function	Number of Hospitals (n=2)		Variance
	2008	*2009*	*Gain/(Loss)*
Electronic Medication Administration Record	2	2	-
Assessing	-	-	-
Implementing	-	-	-
Undecided	-	-	-
Barcode Medication Administration	-	-	-
Assessing	*1*	*1*	-
Implementing	-	*1*	*1*
Undecided	*1*	-	*(1)*
Infection Surveillance Software	1	2	1
Assessing	-	-	-
Implementing	-	-	-
Undecided	*1*	-	*(1)*
Electronic Prescribing	1	1	-
Assessing	-	-	-
Implementing	-	*1*	*1*
Undecided	*1*	-	*(1)*
Electronic Data Exchange	2	1	(1)
Assessing	-	*1*	*1*
Implementing	-	-	-
Undecided	-	-	-

Large

Large hospitals account for approximately 34 percent of all hospitals in the state. A hospital that was included in the assessment of large hospitals in the prior year experienced a decrease in the number of licensed beds and is now included as part of the medium hospital assessment.[46] eMAR has the highest adoption rate at around 88 percent. Approximately 6 percent are undecided about adopting this technology. CPOE and EHRs have adoption rates of about 81 percent. Approximately 6 percent are undecided about adopting CPOE and roughly 12 percent are planning to assess or implement this technology. Around 18 percent plan to assess or implement EHRs, while approximately 6 percent are undecided. BCMA adoption is around 63 percent with approximately 18 percent that plan to assess or implement this technology. Adoption of data sharing technology is reported at about 56 percent, which is roughly 18 percent more than ISS adoption. e-Prescribing is around 12 percent and approximately 69 percent plan to assess or implement this technology.

Health IT Function	Number of Hospitals		Variance
	2008 (n=17)	*2009* (n=16)	*Gain/(Loss)*
Computerized Provider Order Entry	10	13	3
Assessing	*3*	*1*	*(2)*
Implementing	*3*	*1*	*(2)*
Undecided	*1*	*1*	-
Electronic Health Record	14	13	(1)
Assessing	*2*	*1*	*(1)*
Implementing	-	*2*	*2*
Undecided	*1*	-	*(1)*
Electronic Medication Administration Record	11	14	3
Assessing	*2*	*1*	*(1)*
Implementing	*4*	-	*(4)*
Undecided	-	*1*	*1*
Barcode Medication Administration	6	10	4
Assessing	-	*1*	*1*
Implementing	*8*	*2*	*(6)*
Undecided	*3*	*3*	-

[46] Ibid.

| Health IT Function | Number of Hospitals | | Variance |
	2008 (n=17)	2009 (n=16)	Gain/(Loss)
Infection Surveillance Software	**6**	**6**	**-**
Assessing	*2*	*4*	*2*
Implementing	*5*	*2*	*(3)*
Undecided	*4*	*4*	*-*
Electronic Prescribing	**1**	**2**	**1**
Assessing	*2*	*7*	*5*
Implementing	*2*	*4*	*2*
Undecided	*12*	*3*	*(9)*
Electronic Data Exchange	**6**	**9**	**3**
Assessing	*2*	*7*	*5*
Implementing	*2*	*-*	*(2)*
Undecided	*7*	*-*	*(7)*

Medium

Approximately 45 percent of the hospitals in the state are medium in size. EHR adoption is reported at approximately 90 percent, which is a 10 percent increase, and around 5 percent intend to assess this technology. eMAR adoption is roughly 81 percent and around 14 percent plan to assess or implement this technology. The adoption of BCMA increased about 33 percent to around 71 percent with roughly 19 percent that plan to assess or implement. CPOE was reported at around 67 percent with about 29 percent that plan to implement. While approximately 33 percent of medium hospitals are undecided about adopting ISS technology, roughly 48 percent have already implemented this technology. This is about 10 percent more than those that have implemented a data sharing initiative with community providers and roughly 15 percent more than e-prescribing adoption. Approximately 48 percent of these hospitals plan to either assess or implement e-prescribing, while about 19 percent are undecided.

| Health IT Function | Number of Hospitals (n=21) | | Variance |
	2008	2009	Gain/(Loss)
Computerized Provider Order Entry	**13**	**14**	**1**
Assessing	*4*	*-*	*(4)*
Implementing	*3*	*6*	*3*
Undecided	*1*	*1*	*-*
Electronic Health Record	**17**	**19**	**2**
Assessing	*2*	*1*	*(1)*
Implementing	*1*	*-*	*(1)*
Undecided	*1*	*1*	*-*
Electronic Medication Administration Record	**10**	**17**	**7**
Assessing	*2*	*1*	*(1)*
Implementing	*8*	*2*	*(6)*
Undecided	*1*	*1*	*-*
Barcode Medication Administration	**8**	**15**	**7**
Assessing	*-*	*1*	*1*
Implementing	*10*	*3*	*(7)*
Undecided	*3*	*2*	*(1)*
Infection Surveillance Software	**11**	**10**	**(1)**
Assessing	*3*	*4*	*1*
Implementing	*4*	*-*	*(4)*
Undecided	*3*	*7*	*4*
Electronic Prescribing	**2**	**7**	**5**
Assessing	*4*	*8*	*4*
Implementing	*2*	*2*	*-*
Undecided	*13*	*4*	*(9)*
Electronic Data Exchange	**9**	**8**	**(1)**
Assessing	*3*	*6*	*3*
Implementing	*-*	*2*	*2*
Undecided	*9*	*5*	*(4)*

Small

Small hospitals account for approximately 17 percent of the hospitals in Maryland. A hospital that was included in the assessment of medium size hospitals in the prior year experienced a decrease in the number of licensed beds and is now included as part of the small hospital assessment.[47] These hospitals report adoption of EHR and eMAR around 50 percent. Approximately 38 percent are undecided about adopting EHRs and around the same percent plans to assess eMARs. Small hospitals have the same adoption rate of approximately 38 percent for CPOE, e-prescribing, and electronic data exchange with community providers. Approximately 25 percent are undecided about adopting CPOE or implementing data sharing with community providers. Around 38 percent are planning to assess or implement CPOE and the same percent planning to assess a data sharing initiative. BCMA and ISS adoption was reported at approximately 25 percent, while roughly 38 percent plan to assess each of these technologies and the same amount are undecided. Approximately 38 percent are undecided about adopting e-prescribing and about 25 percent plan to assess or implement this technology.

Health IT Function	Number of Hospitals		Variance
	2008 (n=7)	2009 (n=8)	Gain/(Loss)
Computerized Provider Order Entry	**1**	**3**	**2**
Assessing	2	2	-
Implementing	4	1	(3)
Undecided	-	2	2
Electronic Health Record	**5**	**4**	**(1)**
Assessing	1	1	-
Implementing	-	-	-
Undecided	1	3	2
Electronic Medication Administration Record	**1**	**4**	**3**
Assessing	2	3	1
Implementing	3	-	(3)
Undecided	1	1	-
Barcode Medication Administration	**-**	**2**	**2**
Assessing	3	3	-
Implementing	2	-	(2)
Undecided	2	3	1
Infection Surveillance Software	**3**	**2**	**(1)**
Assessing	2	3	1
Implementing	-	-	-
Undecided	2	3	1
Electronic Prescribing	**-**	**3**	**3**
Assessing	2	2	-
Implementing	1	-	(1)
Undecided	4	3	(1)
Electronic Data Exchange	**2**	**3**	**1**
Assessing	1	3	2
Implementing	1	-	-
Undecided	3	2	(1)

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[47] Ibid.

Urban, Suburban, and Rural

An assessment of health IT adoption by geographical location was constructed by dividing hospitals based upon their location in urban, suburban, and rural areas.[48,49] Overall, the average health IT adoption rate of urban hospitals is around 68 percent, roughly 57 percent reported for rural hospitals, and approximately 50 percent for suburban hospitals. Urban hospitals report EHR adoption at around 92 percent, which is about 3 percent more than rural hospitals and roughly 27 percent more than suburban hospitals. Urban hospitals also lead in eMAR adoption with an adoption rate of about 92 percent, which exceeds suburban hospitals by about 16 percent and rural hospitals by around 20 percent. CPOE is reported at around 83 percent in urban locations, which is about 12 percent more than suburban hospitals and roughly 27 percent more than rural hospitals.

Adoption of e-prescribing in urban areas is approximately 42 percent. This is nearly twice as much as suburban and rural hospitals at approximately 24 and 22 percent, respectively. Urban hospitals also lead ISS adoption with a rate of 75 percent, which exceeds rural hospitals by about 42 percent and suburban hospitals by roughly 46 percent. In general, urban hospitals tend to lead in health IT adoption overall, though rural hospitals in Maryland lead in adoption of BCMA at nearly 72 percent. This is about 14 percent higher than urban hospitals and approximately 31 percent more than suburban hospitals. Rural hospitals also have the highest adoption rate in electronic data sharing with community providers at around 56 percent, which is about 15 percent more than suburban hospitals and roughly 23 percent more than urban hospitals.

Urban

Urban hospitals account for approximately 26 percent of the hospitals in Maryland. EHR and eMAR adoption is reported at about 92 percent for these hospitals, which is an increase of around 17 percent for EHRs and 33 percent for eMAR from last year. Approximately 8 percent intend to assess EHRs and the same number of hospitals intend to assess eMARs. CPOE adoption is around 83 percent, which is up roughly 25 percent from the prior year, and about 17 percent plan to either assess or implement this technology. BCMA is adopted in roughly 58 percent of urban hospitals, which is an increase of around 42 percent from the prior reporting period, and approximately 33 percent plan to assess or implement BCMA technology. ISS adoption increased about 17 percent to around 75 percent, which is roughly 33 percent more than e-prescribing and about 42 percent more than the adoption of data sharing technology. About 58 percent plan to assess or implement e-prescribing technology and around 58 percent plan to assess data sharing technology. The slight decrease in the number of hospitals that reported having a data sharing initiative could be attributed to interpretation differences in the question from the prior year.

Health IT Function	Number of Hospitals (n=12)		Variance
	2008	*2009*	*Gain/(Loss)*
Computerized Provider Order Entry	7	10	3
Assessing	*4*	*1*	*(3)*
Implementing	*1*	*1*	*-*
Undecided	*-*	*-*	*-*
Electronic Health Record	9	11	2
Assessing	*1*	*1*	*-*
Implementing	*-*	*-*	*-*
Undecided	*2*	*-*	*(2)*

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[48] Data from the Maryland Department of Planning was used in identifying the urban, suburban, and rural counties.
[49] See *Hospital Characteristics* in Appendix C.

| Health IT Function | Number of Hospitals (n=12) | | Variance |
	2008	2009	Gain/(Loss)
Electronic Medication Administration Record	**7**	**11**	**4**
Assessing	-	*1*	*1*
Implementing	*4*	-	*(4)*
Undecided	*1*	-	*(1)*
Barcode Medication Administration	**2**	**7**	**5**
Assessing	*1*	*2*	*1*
Implementing	*6*	*2*	*(4)*
Undecided	*3*	*1*	*(2)*
Infection Surveillance Software	**7**	**9**	**2**
Assessing	*1*	*3*	*2*
Implementing	*2*	-	*(2)*
Undecided	*2*	-	*(2)*
Electronic Prescribing	**2**	**5**	**3**
Assessing	*1*	*5*	*4*
Implementing	-	*2*	*2*
Undecided	*9*	-	*(9)*
Electronic Data Exchange	**6**	**4**	**(2)**
Assessing	*1*	*7*	*6*
Implementing	-	-	-
Undecided	*5*	*1*	*(4)*

Suburban

Approximately 36 percent of hospitals are located in suburban areas of Maryland. Adoption of eMARs is around 76 percent, which is an increase of roughly 18 percent from the prior year, and about 18 percent either plan to assess or implement eMARs. CPOE adoption is around 71 percent and around 24 percent are undecided. EHR adoption is approximately 65 percent with around 18 percent planning to assess or implement EHRs, and the same percent are undecided. BCMA adoption has reached approximately 41 percent and roughly 29 percent are undecided. The adoption of technology to enable data sharing with community providers increased about 24 percent to approximately 41 percent. Around 47 percent of suburban hospitals are uncertain about adopting ISS and roughly 29 percent have yet to decide on adopting technology that enables electronic data sharing with providers. e-Prescribing adoption increased from no adoption to about 24 percent with roughly 41 percent planning to assess or implement this technology, while around 35 percent are undecided.

| Health IT Function | Number of Hospitals (n=17) | | Variance |
	2008	2009	Gain/(Loss)
Computerized Provider Order Entry	**11**	**12**	**1**
Assessing	*2*	-	*(2)*
Implementing	*4*	*1*	*(3)*
Undecided	-	*4*	*4*
Electronic Health Record	**12**	**11**	**(1)**
Assessing	*3*	*1*	*(2)*
Implementing	*1*	*2*	*1*
Undecided	*1*	*3*	*2*
Electronic Medication Administration Record	**10**	**13**	**3**
Assessing	*4*	*1*	*(3)*
Implementing	*2*	*2*	-
Undecided	*1*	*1*	-
Barcode Medication Administration	**6**	**7**	**1**
Assessing	-	*1*	*1*
Implementing	*5*	*4*	*(1)*
Undecided	*6*	*5*	*(1)*

Health IT Function	Number of Hospitals (n=17)		Variance
	2008	*2009*	*Gain/(Loss)*
Infection Surveillance Software	**6**	**5**	**(1)**
Assessing	*2*	*3*	*1*
Implementing	*4*	*1*	*(3)*
Undecided	*5*	*8*	*3*
Electronic Prescribing	**-**	**4**	**4**
Assessing	*4*	*6*	*2*
Implementing	*1*	*1*	*-*
Undecided	*12*	*6*	*(6)*
Electronic Data Exchange	**3**	**7**	**4**
Assessing	*3*	*5*	*2*
Implementing	*1*	*-*	*(1)*
Undecided	*10*	*5*	*(5)*

Rural

Rural hospitals account for about 38 percent of all Maryland hospitals. EHR adoption is reported at around 89 percent. Roughly 6 percent of these hospitals plan to assess EHR technology and around the same percent are undecided. eMAR and BCMA are equally adopted at approximately 72 percent; an increase of about 33 and roughly 39 percent, respectively. Around 17 percent of hospitals plan to assess each of these technologies and roughly 11 percent are undecided. Approximately 56 percent of rural hospitals have adopted technology to enable data sharing with community providers and roughly 39 percent plan to assess or implement this technology. ISS adoption is reported at around 33 percent and roughly 33 percent remain undecided. Around 22 percent have adopted e-prescribing technology and roughly 56 percent report plans to assess or implement this technology.

Health IT Function	Number of Hospitals (n=18)		Variance
	2008	*2009*	*Gain/(Loss)*
Computerized Provider Order Entry	**8**	**10**	**2**
Assessing	*3*	*2*	*(1)*
Implementing	*5*	*6*	*1*
Undecided	*2*	*-*	*(2)*
Electronic Health Record	**17**	**16**	**(1)**
Assessing	*1*	*1*	*-*
Implementing	*-*	*-*	*-*
Undecided	*-*	*1*	*1*
Electronic Medication Administration Record	**7**	**13**	**6**
Assessing	*2*	*3*	*1*
Implementing	*9*	*-*	*(9)*
Undecided	*-*	*2*	*2*
Barcode Medication Administration	**6**	**13**	**7**
Assessing	*3*	*3*	*-*
Implementing	*9*	*-*	*(9)*
Undecided	*-*	*2*	*2*
Infection Surveillance Software	**8**	**6**	**(2)**
Assessing	*4*	*5*	*1*
Implementing	*3*	*1*	*(2)*
Undecided	*3*	*6*	*3*
Electronic Prescribing	**2**	**4**	**2**
Assessing	*3*	*6*	*3*
Implementing	*4*	*4*	*-*
Undecided	*9*	*4*	*(5)*
Electronic Data Exchange	**10**	**10**	**-**
Assessing	*2*	*5*	*3*
Implementing	*2*	*2*	*-*
Undecided	*4*	*1*	*(3)*

Hospital Affiliation

Health IT adoption was assessed based upon a hospital's affiliation with other hospitals. Hospitals are categorized as having an in-state affiliation (ISA), out-of-state affiliation (OSA), or no affiliation (standalone).[50] ISA hospitals have an average health IT adoption rate of approximately 62 percent, followed by standalone hospitals at about 53 percent, and OSA hospitals at roughly 43 percent. Approximately 92 percent of ISA hospitals have adopted eMARs, which is approximately 25 percent more than OSA hospitals and about 31 percent more than standalone hospitals. ISA hospitals report EHR adoption at around 85 percent and standalone hospitals at about 78 percent, which is roughly 11 percent more than OSA hospitals. CPOE adoption among ISA hospitals is reported at around 69 percent, which exceeds OSA hospitals by roughly 2 percent. ISA hospitals and standalone hospitals have adopted BCMA at a rate of roughly 62 and 61 percent, respectively. OSA hospitals have yet to adopt BCMA or ISS technology. These hospitals report the highest adoption of data sharing technology at about a 67 percent adoption rate, which exceeds ISA hospitals by around 29 percent and standalone hospitals by roughly 17 percent. OSA hospitals have yet to adopt ISS and ISA hospitals report ISS adoption at about 54 percent, which leads the standalone hospitals by roughly 21 percent. Roughly 33 percent of OSA hospitals report using e-prescribing; this exceeds standalone hospitals by around 11 percent and ISA hospitals by about 2 percent.

In-State

ISA hospitals account for approximately 55 percent of all hospitals in the state. These hospitals report adoption of eMARs at approximately 92 percent, which is an increase of about 50 percent. EHR adoption remained at around 85 percent during this reporting period. CPOE adoption increased about 19 percent to roughly 69 percent. BCMA adoption around 62 percent, which is an increase of about 46 percent. Around 23 percent plan to assess or implement CPOE and roughly 19 percent plan to assess or implement BCMA technology. ISS adoption is around 54 percent for these hospitals, which exceeds data sharing with community providers by about 16 percent and e-prescribing at around 23 percent. Roughly 23 percent of these hospitals are uncertain about adopting e-prescribing and the same percent is undecided regarding the adoption of data sharing technology. Approximately 27 percent of ISA hospitals are undecided about adopting ISS and around 19 percent plan to assess this technology for adoption.

Health IT Function	Number of Hospitals *(n=26)*		Variance
	2008	*2009*	*Gain/(Loss)*
Computerized Provider Order Entry	13	18	5
Assessing	*4*	*1*	*(3)*
Implementing	*8*	*5*	*(3)*
Undecided	*1*	*2*	*1*
Electronic Health Record	22	22	-
Assessing	*3*	*-*	*(3)*
Implementing	*-*	*2*	*2*
Undecided	*1*	*2*	*1*
Electronic Medication Administration Record	11	24	13
Assessing	*2*	*1*	*(1)*
Implementing	*13*	*-*	*(13)*
Undecided	*-*	*1*	*1*
Barcode Medication Administration	4	16	12
Assessing	*2*	*2*	*-*
Implementing	*15*	*3*	*(12)*
Undecided	*5*	*5*	*-*

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[50] See *Hospital Characteristics* in Appendix C.

| Health IT Function | Number of Hospitals (n=26) | | Variance |
	2008	2009	Gain/(Loss)
Infection Surveillance Software	**15**	**14**	**(1)**
Assessing	*3*	*5*	*2*
Implementing	*4*	*-*	*(4)*
Undecided	*4*	*7*	*3*
Electronic Prescribing	**1**	**8**	**7**
Assessing	*2*	*9*	*7*
Implementing	*3*	*3*	*-*
Undecided	*20*	*6*	*(14)*
Electronic Data Exchange	**12**	**10**	**(2)**
Assessing	*2*	*10*	*8*
Implementing	*1*	*-*	*(1)*
Undecided	*11*	*6*	*(5)*

Out-of-State

OSA hospitals account for approximately 6 percent of the hospitals in Maryland. Around 67 percent of these hospitals have adopted CPOE, EHRs, eMARs, and are exchanging data with community providers. The remaining hospitals are undecided about adopting CPOE and plan to assess EHR and eMAR technology. OSA hospitals have yet to adopt BCMA or ISS technology. Around 67 percent are planning to assess or implement BCMA and all of these hospitals intend to assess or implement ISS technology. Data sharing technology had the highest increase in adoption among OSA hospitals at around 67 percent with the remaining hospitals planning to assess this technology. Adoption of e-prescribing is reported by OSA hospitals at approximately 33 percent, around 33 percent are planning to implement, and about the same percent are undecided.

| Health IT Function | Number of Hospitals (n=3) | | Variance |
	2008	2009	Gain/(Loss)
Computerized Provider Order Entry	**2**	**2**	**-**
Assessing	*1*	*-*	*(1)*
Implementing	*-*	*-*	*-*
Undecided	*-*	*1*	*1*
Electronic Health Record	**1**	**2**	**1**
Assessing	*1*	*1*	*-*
Implementing	*-*	*-*	*-*
Undecided	*1*	*-*	*(1)*
Electronic Medication Administration Record	**2**	**2**	**-**
Assessing	*-*	*1*	*1*
Implementing	*-*	*-*	*-*
Undecided	*1*	*-*	*(1)*
Barcode Medication Administration	**-**	**-**	**-**
Assessing	*-*	*1*	*1*
Implementing	*2*	*1*	*(1)*
Undecided	*1*	*1*	*-*
Infection Surveillance Software	**-**	**-**	**-**
Assessing	*1*	*2*	*1*
Implementing	*1*	*1*	*-*
Undecided	*1*	*-*	*(1)*
Electronic Prescribing	**-**	**1**	**1**
Assessing	*1*	*-*	*(1)*
Implementing	*-*	*1*	*1*
Undecided	*2*	*1*	*(1)*
Electronic Data Exchange	**-**	**2**	**2**
Assessing	*1*	*1*	*-*
Implementing	*-*	*-*	*-*
Undecided	*2*	*-*	*(2)*

Standalone

Standalone hospitals account for 38 percent of the hospitals in the state. Adoption of EHRs is reported at around 78 percent and approximately 11 percent of standalone hospitals are planning to assess EHRs. CPOE adoption is around 67 percent and roughly 28 percent plan to assess or implement this technology. eMAR and BCMA have equivalent adoption rates at around 61 percent, about 28 percent of standalone hospitals plan to assess or implement these technologies, and approximately 11 percent are undecided. Data sharing technology experienced an increase of about 11 percent to around 50 percent and roughly 44 percent that plan to assess or implement this technology. ISS adoption is around 33 percent and about 39 percent of standalone hospitals remain undecided. Adoption of e-prescribing is approximately 22 percent, around 61 percent of standalone hospitals plan to assess or implement e-prescribing and roughly 17 percent are uncertain about adopting this technology.

Health IT Function	Number of Hospitals (n=18)		Variance
	2008	*2009*	*Gain/(Loss)*
Computerized Provider Order Entry	11	12	1
Assessing	*4*	*2*	*(2)*
Implementing	*2*	*3*	*1*
Undecided	*1*	*1*	*-*
Electronic Health Record	15	14	(1)
Assessing	*1*	*2*	*1*
Implementing	*1*	*-*	*(1)*
Undecided	*1*	*2*	*1*
Electronic Medication Administration Record	11	11	-
Assessing	*4*	*3*	*(1)*
Implementing	*2*	*2*	*-*
Undecided	*1*	*2*	*1*
Barcode Medication Administration	10	11	1
Assessing	*2*	*3*	*1*
Implementing	*3*	*2*	*(1)*
Undecided	*3*	*2*	*(1)*
Infection Surveillance Software	6	6	-
Assessing	*3*	*4*	*1*
Implementing	*4*	*1*	*(3)*
Undecided	*5*	*7*	*2*
Electronic Prescribing	3	4	1
Assessing	*5*	*8*	*3*
Implementing	*2*	*3*	*1*
Undecided	*8*	*3*	*(5)*
Electronic Data Exchange	7	9	2
Assessing	*3*	*6*	*3*
Implementing	*2*	*2*	*-*
Undecided	*6*	*1*	*(5)*

Remarks

Hospitals throughout the state continued to advance health IT adoption over the last year. Health IT holds promise to improve patient care, decrease costs, and increase efficiencies. The survey results suggest that Maryland hospitals are making significant investments in health IT. The most prominent advancements are in the areas of medication management, specifically, eMAR and BCMA with each increasing approximately 28 percent. Recent efforts to strengthen medication management protocols in hospitals (i.e., medication reconciliation, mitigating adverse drug events, etc.) are considered key drivers in the adoption of health IT. About 81 percent of hospitals currently utilize EHRs with the highest adoption rate among urban hospitals, followed by rural and suburban hospitals. e-Prescribing of discharge medications to pharmacies has the lowest adoption rate during this reporting period, yet this technology experienced around a 19 percent increase in adoption.

Maryland continues to keep pace with other states in implementing health IT. Maryland hospitals exceed national trends when it comes to fully adopting CPOE and EHRs in all PCUs and this essential holds true with respect to eMAR and BCMA.[51] National data indicates that rural hospitals are less likely to adopt EHRs and that large hospitals adopt this technology more rapidly.[52] The findings in Maryland contradict these trends as both rural hospitals exceed suburban hospitals and medium size hospitals surpass large hospitals in EHR adoption.

Efforts at the national level focus on expanding the adoption and meaningful use of health IT to improve the quality, safety, and efficiency of health care. The *Health Information Technology for Economic and Clinical Health Act* (HITECH Act), a section of the *American Recovery and Reinvestment Act of 2009* (ARRA), includes a substantial amount of funding for hospitals to adopt EHRs. These incentives are expected to help offset hospital investments in implementing this technology. Incentives under the HITECH Act are available to hospitals for roughly four years provided hospitals become meaningful users by 2013.

The effort among CIOs in Maryland to expand health IT is notable. Not long ago, CIOs were mainly concerned with how hospital networks were functioning and whether staff could access the information they needed through the network. The role of a CIO has expanded dramatically to serve as the nexus for a wide variety of projects both internal to the hospital and to the community it serves. Almost all CIOs are engaged in community and statewide efforts to implement consumer-centric data sharing that will allow patient information to be available when and where it is needed. The findings in this year's survey are a clear indication that Maryland hospitals, largely through the work of the CIOs, are making progress in advancing health IT.

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[51] Ibid.
[52] Ibid.

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Appendix A

Survey Questions

The *2009 Hospital Health Information Technology Survey* is outlined below The first section of the report identified the number of primary care units (PCUs), which enabled an assessment of the extent of utilization. The next section asked the hospital to provide an overview on the number of all patient care orders and the number of medication orders, with an indication of the number that were electronic and the number completed on paper. The remaining sections of the survey include: Order Entry, Electronic Health Record, Medication Administration (includes eMAR and BCMA), Infection Management, and Health Information Exchange (includes e-prescribing and electronic data sharing with community providers). Hospitals were asked to answer the planning questions (see Planning Questions section at the end of the survey) if any question identified with an * below was a "No" response.

Primary Care Units (PCUs) *(Indicate the number of departments for each specialty)*

Critical Care	Outpatient (Ambulatory) Surgery
Emergency Department	Post Anesthesia Care Unit (PACU)
Labor and Delivery (L&D)	Short-Stay (23 hour observation)
Medical/Surgical	Telemetry
Mother/Baby	Pediatrics
Operating Room (OR)	Psychiatric

Patient Orders Overview

1. What was the total of all inpatient orders (both paper and electronic) for the primary care units last month *(enter value)*?
    a. How many were submitted electronically by providers? *(enter value)*
2. What was the total inpatient medication orders (both paper and electronic) for the primary care units last month *(enter value)*?
    a. How many were submitted electronically by providers? *(enter value)*
3. What is your most recent HIMSS EMR Adoption Model Ranking? *(enter value: 0-7)*

Order Entry

1. *Does your hospital have an order entry system that allows providers (MD, DO, NP, PA) to electronically enter all patient care orders for laboratory, radiology, pharmacy, nursing, respiratory, ultrasound, PT/OT, etc? *If no, go to Planning Questions.*
    a. Which orders can the provider enter electronically *(select all that apply)*: pharmacy, laboratory, radiology, nursing, respiratory, ultrasound, PT/OT, or dietary.
2. *Does your system allow providers (MD, DO, NP, PA) to electronically view the status and results of laboratory, radiology, pharmacy, nursing, respiratory, and PT/OT?
3. *Does your system have an order set feature where a group of orders can be selected based upon a problem or diagnosis?
4. Does this system offer decision support software for medication prescribing, including drug-drug; drug-food; contraindication/dose limit for diagnosis, allergies, age/weight, lab/radiology results?
    a. Is this feature implemented and operationalized?
    b. Does the software offer links to resources for reference?
    c. Is electronic documentation required for overriding an interception?

5. Does this system offer decision support software for diagnosis, chronic conditions, and standards of care, including heart failure, diabetes, or other appropriate treatments such as pneumonia vaccination, flu shot, etc.?
    a. Is this feature implemented and operationalized?
    b. Does the software offer links to resources for reference?
    c. Is electronic documentation required for overriding an interception?
6. Is information from pharmacy, laboratory, and admitting-discharge-transfer integrated into the order entry process?
7. Does the system have an active "read-back order" function for verbal/phone orders?

Electronic Health Record (EHR)

1. *Does your hospital have an EHR? *If no, go to Planning Questions*
    a. Which documentation can be entered electronically *(select all that apply)*: medication administration, physician progress notes, physician H&P/assessment, nursing assessment , nursing notes, vital signs, respiratory notes, PT/OT notes.
2. *Does your system allow review of previous admission data?
3. *Does your system provide patient assignment lists?

Medication Administration

1. *Does your hospital have an electronic medication administration record (eMAR)? *If no, go to Planning Questions.*
2. *Does your hospital have a Barcode Medication Administration (BCMA) system for medication administration? *If no, go to Planning Questions.*
3. Does your hospital have a medication reconciliation system in place for admission, discharge, and changes in level of care?

Infection Management

1. Does your hospital use infection surveillance software to manage your organization's infectious diseases? *If no, go to Planning Questions.*
2. Does your reporting to the NHSN exceed minimum reporting requirements?
3. Is your hospital linked to Centers for Disease Control – Alert System?

Health Information Exchange

1. Does your hospital have a system to electronically prescribe discharge medications directly to community pharmacies? *If no, go to Planning Questions.*
2. Does your hospital have a system capable of electronic data exchange for consultation or transfer of care with outpatient providers, such as physicians, long term care, etc.?

Planning Questions

Planning questions were incorporated in all survey sections as appropriate.

1. If no, is your hospital:
    a. Assessing a _____ system within 12 months?
    b. Implementing a _____ system within 12 months?
    c. Undecided at this time?

Appendix B

Survey Glossary

Barcode Medication Administration (BCMA):

Technology that allows for the real-time confirmation of the "five rights" - right patient, right medication, right dose, right route, and right time - for medication administration.

Clinical Decision Support:

Computer application to assist in clinical decisions by providing evidence-based knowledge in the context of patient-specific data.

Computerized Physician Order Entry (CPOE):

Computer-based application system for ordering providers (MD, DO, NP, PA) to enter patient care orders directly into the computer system at the point of care.

Electronic Health Record (EHR):

A longitudinal collection of electronic health information that serves as a legal medical record, which includes documentation, vital signs, and assessments, among other things.

Electronic Medication Administration Record (eMAR):

An electronic format of the traditional paper-based medication administration record.

Electronic Prescribing (e-prescribing):

Electronic transmission of prescriptions directly to the dispensing pharmacy by the ordering provider.

Health Information Exchange (HIE):

Electronic movement of health-related information among health care providers.

Health Information Technology (HIT):

Technology used to maintain health information electronically.

Infection Surveillance Software (ISS):

An application that monitors the events of infectious disease.

Order Set:

A group of evidenced-based orders for specific diagnosis or problems.

Primary Care Unit:

The hospital departments where patients receive health care and are typical of any acute care hospital, despite the size of the facility, and include: Critical Care, Emergency Department, Labor and Delivery (L&D), Medical/Surgical, Mother/Baby, Operating Room (OR), Outpatient (Ambulatory) Surgery, Post Anesthesia Care Unit (PACU), Short-Stay (23 hour observation), Telemetry, Pediatrics, and Psychiatric

Appendix C

Hospital Characteristics

Hospital	Size	Geography	Affiliation
Anne Arundel Medical Center	Large	Suburban	None
Atlantic General Hospital	Small	Rural	None
Baltimore Washington Medical Center	Large	Suburban	In-State[3]
Bons Secor Hospital	Medium	Urban	Out of State
Braddock Memorial	Medium	Rural	In-State
Calvert Memorial Hospital	Medium	Rural	None
Carroll Hospital Center	Medium	Rural	None
Chester River	Small	Rural	In-State[3]
Civista Medical Center	Medium	Rural	None
Doctors Community Hospital	Medium	Suburban	None
Dorchester General Hospital	Small	Rural	In-State[3]
Edward W. McCready	Small	Rural	None
Fort Washington	Small	Suburban	None
Franklin Square Hospital	Large	Suburban	In-State[2]
Frederick Memorial Hospital	Large	Rural	None
Garrett County	Small	Rural	None
Greater Baltimore Medical Center	Large	Suburban	None
Good Samaritan Hospital	Medium	Urban	In-State[2]
Harbor Hospital	Medium	Urban	In-State[2]
Harford Memorial Hospital	Medium	Rural	In-State[3]
Holy Cross Hospital	Large	Suburban	Out of State
Howard County General Hospital	Medium	Suburban	In-State[1]
James Lawrence Kernan Hospital	Small	Urban	In-State[3]
Johns Hopkins Bayview Hospital	Large	Urban	In-State[1]
Johns Hopkins Hospital	Academic	Urban	In-State[1]
Laurel Regional Hospital	Small	Suburban	In-State
Maryland General Hospital	Medium	Urban	In-State[3]
Memorial Hospital at Cumberland	Medium	Rural	In-State
Memorial Hospital at Easton	Medium	Rural	In-State[3]
Mercy Hospital	Medium	Urban	None
Montgomery General Hospital	Medium	Suburban	In-State[2]
Northwest Hospital	Medium	Suburban	In-State
Peninsula Regional Medical Center	Large	Rural	None
Prince George's Hospital Center	Medium	Suburban	In-State
Shady Grove Adventist Hospital	Large	Suburban	In-State
Sinai Hospital	Large	Urban	In-State
Southern Maryland Hospital	Large	Suburban	None
St. Agnes Hospital	Large	Urban	None
St. Joseph Medical Center	Large	Suburban	Out of State
St. Mary's Hospital	Medium	Rural	None
Suburban Hospital	Medium	Suburban	None
Union Hospital of Cecil County	Medium	Rural	None
Union Memorial Hospital	Large	Urban	In-State[2]
University of Maryland Medical Center	Academic	Urban	In-State[3]
Upper Chesapeake Medical Center	Medium	Rural	In-State[3]
Washington Adventist Hospital	Large	Suburban	In-State
Washington County Hospital	Large	Rural	In-State

Size *(licensed beds)*	Geography	Affiliation
Academic: >500	Urban: Baltimore City	None: No affiliation
Large: 251 – 500	Suburban: Anne Arundel, Baltimore, Howard, Montgomery, and Prince George's Counties	In-State: affiliated with another hospital in Maryland
Medium: 100 – 250	Rural: Allegany, Calvert, Caroline, Carroll, Cecil, Charles, Dorchester, Frederick, Garrett, Harford, Kent, Queen Anne's, Somerset, St. Mary's, Talbot, and Washington Counties	Out of State: affiliated with a hospital outside of Maryland
Small: <100		*1=Johns Hopkins Health System; 2=MedStar Health; 3=University of Maryland Medical System*

Appendix D

2009 Hospital HIT Survey Results											
	Aggregate	Hospital Size				Geographic Location			Hospital Affiliation		
Key IT Components	All Hospitals	Academic	Large	Medium	Small	Urban	Suburban	Rural	In State	Out of State	Standalone
Number of Hospitals	47	2	16	21	8	12	17	18	26	3	18
Percentage of Hospitals	100	4	34	45	17	26	36	38	55	6	38
Order Entry											
Yes	32	2	13	14	3	10	12	10	18	2	12
Planning Projections											
Assessing	3	-	1	-	2	1	-	2	1	-	2
Implementing	8	-	1	6	1	1	1	6	5	-	3
Undecided	4	-	1	-	2	-	4	-	2	1	1
Clinical Decision Support											
Medications											
Yes	28	2	10	13	3	8	11	9	17	1	10
Diagnosis											
Yes	19	2	9	7	1	6	8	5	13	1	5
Electronic Health Records (EHRs)											
Yes	38	2	13	19	4	11	11	16	22	2	14
Planning Projections											
Assessing	3	-	1	1	1	1	1	1	-	1	2
Implementing	2	-	2	-	-	-	2	-	2	-	-
Undecided	4	-	-	1	3	-	3	1	2	-	2
Electronic Medication Administration Records (eMARs)											
Yes	37	2	14	17	4	11	13	13	24	2	11
Planning Projections											
Assessing	5	-	1	1	3	1	1	3	1	1	3
Implementing	2	-	-	2	-	-	2	-	-	-	2
Undecided	3	-	1	1	1	-	1	2	1	-	2
Barcode Medication Administration (BCMA)											
Yes	27	-	10	15	2	7	7	13	16	-	11
Planning Projections											
Assessing	6	1	1	1	3	2	1	3	2	1	3
Implementing	6	1	2	3	-	2	4	-	3	1	2
Undecided	8	-	3	2	3	1	5	2	5	1	2
Infection Surveillance Software											
Yes	20	2	6	10	2	9	5	6	14	-	6
Planning Projections											
Assessing	11	-	4	4	3	3	3	5	5	2	4
Implementing	2	-	2	-	-	-	1	1	-	1	1
Undecided	14	-	4	7	3	-	8	6	7	-	7
Electronic Prescribing (e-Prescribing)											
Yes	13	1	2	7	3	5	4	4	8	1	4
Planning Projections											
Assessing	17	-	7	8	2	5	6	6	9	-	8
Implementing	7	1	4	2	-	2	1	4	3	1	3
Undecided	10	-	3	4	3	-	6	4	6	1	3
Electronic Data Exchange with Providers											
Yes	21	1	9	8	3	4	7	10	10	2	9
Planning Projections											
Assessing	17	1	7	6	3	7	5	5	10	1	6
Implementing	2	-	-	2	-	-	-	2	-	-	2
Undecided	7	-	-	6	2	1	5	1	6	-	1

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